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ACCORDING to the Paris correspondent of the *Builder*, Messrs. Krantz and Viollet-le-Duc have in hand the design of the buildings for the French exhibition of 1878, into which are to be incorporated the general arrangement of MM. Bandot, the garden of M. Coquart, the bridge of M. Eiffel, and the atrium of M. Davioud. The correspondent writes of an enormous monumental column, with which, he says, the French propose to crown the group of buildings which is to be put up upon the Trocadero for the *Exposition*. This structure, which is to be built of iron, it is proposed to carry to the preposterous height of eight hundred feet (two hundred and sixty metres). It is to be utilized for a lighthouse, which is unnecessary, and for an observatory, for which, by reason of its vibration, it would be sure to be found useless, and for various philosophical experiments upon the velocity of light and the fall of bodies; and it is to be a permanent structure — perhaps on account of the difficulty of getting it down after it is once raised.

THE *Builder's* correspondent does not seem to have great faith that it will really be built. If it is, it will, perhaps, exert indirectly a good effect on this side of the water; for the projectors of the Washington Monument, finding themselves utterly distanced in what was the main effort of the designer, — to build something taller than men ever built before, — may be led to aspire to some other excellence in their work, and may think it well to change their design. The latest word, by the way, that we have heard about the Washington Monument is, that, as soon as the monument is conveyed to the United States, the Commission will set to work to test the strength of the foundation, and, if it is found sufficient, will "proceed at once with the completion of the monument, without any deviation whatever from the present plan."

TWO or three recent lawsuits, which are of more or less interest to architects, are reported in the last number of the *Revue Générale de l'Architecture*. Among them the following is, at least, a curious one. The people of Fresnay-Reugny, in the Department of Nièvre, had decided to build a new church; and an architect, Lutz, had designed for them, and a builder, Davaud, had contracted for, a Romanesque church. The *maire* of the town, under whom the building was undertaken, M. Comte, had greatly interested himself in the project, had secured subscriptions for the church, and had, in a general way, "bossed" the project. He, not satisfied with the design that had been adopted, persuaded the architect to change his design to a more elaborated one in pointed Gothic, promising that he would make every thing right. Presently, however, he was succeeded by another *maire;* and complaint was made against the architect and contractor, who, by a judgment of the *conseil de préfecture*, were condemned to pay together the difference in cost between the original design and the substituted one. The architect and the contractor, falling back upon the ex-mayor's promise to protect them, sued him before the civil tribunal of Nevers for damages. This tribunal, denying jurisdiction, referred the case to another court. but took occasion to intimate its opinion that M. Comte's action, though it might not be binding on the town, still could not be divested of its executive character: the long and short of which we take to be, that, whoever was responsible pecuniarily, the architect and contractor could not be so. However, the architectural traveller who remembers the lovely form of Romanesque architecture that is indigenous to that part of France, and the ill-at-home look of the little Gothic work there is there, could perhaps with complacency see somebody punished for making the change.

ANOTHER case, at Lille, was where a proprietor, having engaged an architect on the usual terms of five per cent, saw fit to drop him when his buildings had reached the third floor, offering him only part of his commission. The Court ruled that certain charges of negligence against the architect were not sustained, and, intimating that they were merely pretexts to save a fee, held the proprietor bound to pay the full percentage. In a third case, at Douai, a proprietor, after his building was finished, having paid his mechanics without waiting for the architect to audit the accounts, had claimed a reduction from his fees in consequence. The Court held that, since the architect had not refused to examine the accounts, the proprietor must be held to have waived his doing so, and the architect to have done all that was required of him; so that there was no reason for refusing to pay the fee established by usage, which was five per cent. It should be remembered, that the *vérification des mémoires*, as the examination of the builders' accounts is called in France, is there a much more complicated business than it is with us, and that it is there considered to cover a considerable part of his fee.

THE summer exercises of the students of the School of Practical Engineering at the Crystal Palace at Sydenham furnish some suggestions which it might be worth while for our schools to imitate. The school itself, to which a portion of the palace is assigned, seems to be extremely well appointed, and is provided with workshops of various kinds, including carpenter's shop, pattern shop, foundery, and finishing shop, and gives students practical training in the use of tools, as well as in the planning and carrying-out of work. The students were in camp for ten days on an island in the Geological Lake at Sydenham; and one of their camp exercises was the building of "a very strong double lever spar-bridge," of about forty feet span, and nine foot roadway. Complete working-drawings, a specification, and a model to a scale of one-twelfth, were prepared for the bridge. The students also built a number of models, on a large scale, of frame houses, and showed good specimens of work in carpentry, such as dove-tailing, mitring, mortising, and tenoning. It would be well worth while, we should think, to give such a practical turn to the summer exercises of some of our industrial and technological schools. It is a real advantage to students of construction to have some practice in the actual handling of materials, and distribution of work among workmen, — a thing which it is hard to get without a regular apprenticeship to a trade, even if they are provided with workshops where they have an opportunity to learn the handling of tools, — and to leave behind them, after one of their excursions, a structure of actual utility, such as a bridge, would be to give an evidence of practical efficiency, which would undoubtedly do a good deal to secure confidence and support for them from the public, which is very easily wrought upon by visible and practical results. The Massachusetts Institute of Technology, aided by the Massa-

chusetts Charitable Association, has already taken an important step by establishing a series of workshops, which will be used for the instruction, in mechanical work, of students in the department of practical mechanism.

THE work on the Brooklyn Bridge has not yet been interfered with, and attracts great attention as it goes on. The first of the endless ropes, or "travellers," by which the cables are to be laid, was got into place several days ago, and on Thursday last week was successfully spliced and tightened. The rope is worked from the Brooklyn anchorage, whence it is carried over wheels, on the tops of the two piers, to the New York anchorage. There it passes round two horizontal wheels fixed at the ends of a trussed frame, which is set up in a vertical plane, parallel to the face of the abutment, and which can be advanced or withdrawn so as to give the requisite tension to the rope. From these wheels, it passes back over the tops of the piers to the Brooklyn anchorage, and into itself, forming, as we said, a continuous endless rope. At the Brooklyn end, it passes over four horizontal wheels. Three of these, which serve merely as pulleys, are set in a row, in a frame placed like that on the New York anchorage: in front of the middle one is the large driving-wheel. The rope, received on one of the outer wheels or pulleys, is carried round that, then forward and round the driving-wheel, then back, around the centre wheel behind it, forward and round the driving-wheel again, and then back to the other outside wheel, from which it passes out to recross the river. This complication and double turn round the driving-wheel is, of course, to give a better grip for moving the rope, which is done by a thirty-horse-power engine set up in front of the base of the anchor pier, and connected with the driving-wheel by shafting and gearing.

THIS travelling-rope once in running order makes it possible to carry on the rest of the work more rapidly. Two such "travellers" are needed, one for the laying of each cable. On last Saturday the one in place was utilized for the first time in laying its fellow; and the first transit of workmen was accomplished by means of it. The second rope was made fast to a point of the first, and, the traveller being set in motion, was slowly drawn across the river from the Brooklyn side, being fastened to the "traveller" as it was drawn out, by successive lashings with wire at every fifty feet. This took about two hours. Then two chairs, or "buggies," which were simply small railed platforms hung from grooved wheels which traversed the travelling rope, and guided by ropes from the piers, were sent out, each with one workman in it, and running down the sag of the traveller from the piers to the two anchorages, allowed the workmen in them to cut the lashings, and free the new traveller from its fellow. The buggies were then drawn back to the piers, and again sent down the central span, the men cutting the lashings there also, till they met in the centre of the river, and the new rope was free. Then the buggies were lashed together, and both drawn back to the Brooklyn pier. As soon as the temporary bridges are hung from the travellers, the cables will be laid from them, the wires which form them being stretched one by one; and, as fast as the separate strands are finished (each of three hundred and thirty parallel wires), they will be bound up by temporary wrappings of wire a foot and a half apart, and dropped into the saddles that rest on the piers; and, when a cable is laid, it will be wrapped from end to end. Each cable will contain nineteen strands, comprising 6,270 wires.

As we go to press, we read that the Monument Society has voted to transfer the monument to the government. The first third has cost $230,000, and the $200,000 voted by government will hardly finish it. A subscription is to be opened.

THE EXPOSITION OF 1878.

THE French journals lately received show that the project for the Exhibition of 1878 is coming into definite shape, and indicate that the work of preparing for it will be pressed forward with energy. A report that it was likely to be deferred on account of the shortness of the time which remains for the preparations proves unfounded; and the Minister of Commerce, who is at the head of the Commission, is confident that there is time for the necessary work. Our readers will probably be interested in an account of the progress of the movement thus far, the material for which we owe mainly to the *Revue de l'Architecture*, and *La Semaine des Constructeurs*.

The Commission includes, under the presidency of the Ministers of Agriculture and Commerce, of Public Instruction and of Fine Arts, the Vice-President of the Senate, five Senators, three Members of the Chamber, and a number of other officials, and various artists and architects, among whom are MM. Gérôme, Lefuel, Levasseur, Meissonier, Rondelet, and Viollet-le-Duc. The work of drawing up the necessary scheme was intrusted to a sub-committee, of which M. Viollet-le-Duc was the *rapporteur*, — chairman, we suppose we may say. Several propositions were laid before the committee, among which the most adventurous was that of M. Henri Bionne, for occupying the Garden of the Tuileries, the Place de la Concorde, the Avenue des Champs Elysées as far as and including the Palais de l'Industrie and the Esplanade des Invalides, which was to be united with the rest by a special bridge. Other propositions were to occupy part of the Bois de Bologne, or the Park of St. Cloud, or Longchamp, or, finally, the Champ de Mars, where, as will be remembered, the Exhibition of 1867 was held. The sub-committee, after no long delay, reported in favor of the Champ de Mars, as being easier of access than the other sites proposed, except the one first mentioned, which was judged impracticable. The question had been raised between temporary or permanent buildings; and the committee decided in favor of the former, on the ground that World's Fairs were yet too new, and their dimensions and requirements too undetermined, to warrant the building of a permanent structure for them. On the 26th of April last, an open competition was announced, of which the following were the principal conditions: —

That the grounds occupied should be the Champ de Mars, and the place called the Trocadéro, opposite it on the north side of the river; the space to be covered by the buildings being of the Champ de Mars, 220,000 square metres (say 270,000 square yards), and, of the Trocadéro site, 50,000 metres (say 60,000 yards);

That the chief building in the Champ de Mars should be rectilinear in outline, and should consist of an iron frame, filled in with brick or other masonry, and so designed as to be built in a series of similar panels, "repeated *ad infinitum*," which could be manufactured, and put up or taken down, in the smallest possible time, and should command sale at the end of the Exposition by being easily available for other constructions. The building was to be so planned as to allow the exhibits to be arranged in pursuance of the system of the Exhibition of 1867, — in intersecting columns as it were, "like the multiplication-table;" so that the visitor moving in one direction could follow the various products of any one country, and in the cross direction could trace similar products through the exhibits of different countries: the centre of the building, however, was to be reserved for the display of fine arts;

That, on the highest part of the Trocadéro, a hall should be built, to hold ten thousand persons, which should serve for the public meetings incident to the Exposition, for concerts, and the trial of musical instruments, and for lectures. The rest of the buildings in the Trocadéro were to be reserved for the exhibition of agriculture, horticulture, mines, naviga-

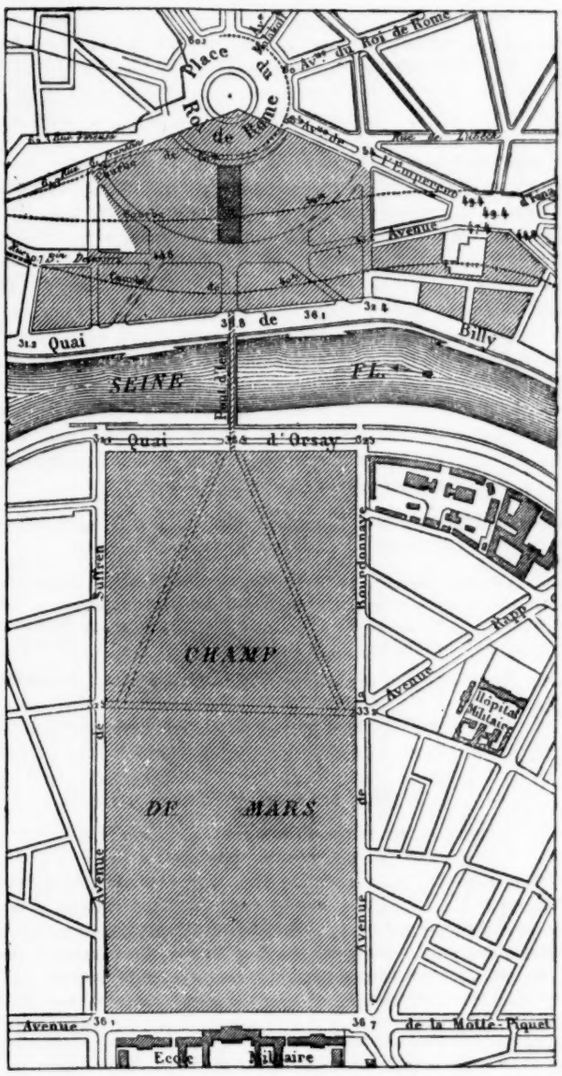
tion, and heating and ventilation. The buildings in the Trocadéro were to be connected with those in the Champ de Mars by a covered gallery, stretching across the quays and the Bridge of Jena at a height of not less than five metres (say sixteen feet) above the roadway of the bridge, and bordered on each side by a row of shops.

A first prize of five thousand francs was offered, a second prize of three thousand, and three third prizes of two thousand each. Only twenty days were given for the preparation of the designs, which were to be accompanied by estimates based on the cost per square meter, but including allowances for sewerage, drainage, gas, water, and lighting-apparatus. In spite of the amount of work required, and the shortness of the time allowed, designs were received from ninety-four competitors. The first premium was not awarded, because it was not considered that any of the plans submitted could be carried out to advantage without considerable modifications, which was natural enough under the circumstances; but the number of second prizes was increased to six, which were awarded to the designs of MM. Brunot, Crépinet, Coquart, Picq, Roux, and Davioud & Bourdais, classed as of equal merit. Six second prizes were also awarded on equal footing to MM. De Baudot, Eiffel, Flon, Hue, Raulin, and Simil.

In spite of the precision with which the conditions were detailed in the programme, considerable variety of treatment was found in the designs submitted. The "table of Pythagoras," as it was called in the programme, was treated in a variety of ways, of which the most successful were the continuation of it around three or four sides of a rectangular building, with the required reservation in the centre. The last of these ways, of course, simply gave the building of 1867 reduced to a rectangle; which is convenient as a matter of arrangement, but gives a building without a front, and consequently does not lend itself much to architectural effect. The first leaves an open end, so to speak, which is the natural front of the building, and which was improved by some of the competitors, who made it a broad vestibule, from which the visitors could set out on their course, following around the other three sides in order, and returning to it. There was naturally greater variety in the treatment of the buildings on the Trocadéro side; some grouping them in a semicircle, concave toward the river and the end of the bridge; others on an arc, with its convexity in the same direction, and others, again, arranging them in lines on each side of the grand ramp which ascends from the bridge. The plan, which we copy from the *Revue Générale de l'Architecture*, shows very clearly the position and shape of the grounds and the approaches; and the figures upon it show the various levels referred to the sea. It will be noticed that the rectangle of the Champ de Mars is nearly level, rising slightly toward the south. What is called the Trocadéro is a low hill. The part assigned to the Exposition grounds may be roughly considered as a pretty flat part of a sphere, of which the vertical pole is in the centre of the Place du Roi de Rome, where the rise above the quay is something like eighty feet. The problem of connecting the two grounds was solved in various ways. Many of the competitors, wisely considering that the means suggested in the programme were inadequate, departed more or less from the directions: and some of them proposed two auxiliary bridges; others proposed to increase the capacity of the Pont de Jena by corbelling out on each side of it. The various projects were put into the hands of the sub-committee. This committee assumed the difficult work of comparing the various designs, and educing from them all, and combining, the features which will give the most perfect whole, and of selecting the architect who should carry them out.

In addition to the required communication between the two grounds, it was necessary to provide against the interruption of the circulation of foot-passengers and vehicles along the quays, and across the river, and especially for the crossing, at this point, of a large laboring population.

The final determination of the Commission has not yet been published; but the Minister of Commerce has recently announced that the leading features of the plan have been fixed upon. The gallery which was to have crossed the Bridge of Jena has been given up. The bridge itself will be doubled in width, and reserved for the uses of the Exposition, as will also the quays on both sides in front of the grounds. The traffic on the quays is to be carried through deep cuttings, under the Champ de Mars and the Trocadéro; and that across the river is to be provided for by a steam ferry.



We take from *La Semaine des Constructeurs* the following passages from the Report of the Minister of Commerce: —

"The buildings on the Trocadéro will consist of a great central hall, built on the highest part of the plateau, and seating from six to eight thousand persons. This hall is to be devoted to concerts, musical competitions, the hearing of large instruments, and to public meetings. . . . Its construction, studied with reference to the most favorable acoustic arrangement, may be permanent, and remain *in situ* after the Exposition. From the base of the great hall, which forms in the centre a vast rotunda, surrounded by porticos of two stories, flows a cascade, which, descending in the place occupied by the present stairs, will fall midway into a basin to form a reservoir for the supply of the garden in the Champ de Mars. Great stairways, set at the sides of the entering peristyles, will give the Public access to the porticos, to the tribunes of the great hall, and to the lecture-rooms over the peristyles. In the garden are arranged the greenhouses, an aquarium, *cafés*, and various picturesque structures.

The estimate which is submitted is as follows, in francs: —

Buildings	23,228,000
Park and Cascade	3,265,000
Running the Machinery	1,500,000
Cuttings for Traffic of Quays	500,000
Water and Gas	950,000
Fine Art Exhibition	100,000
Temporary Exhibition of Animals	300,000
Fencing and Gates	370,000
Running Expenses	1,800,000
Restoration of the Champ de Mars	300,000
Total	32,313,000
To this are added: —	
For the Prize Medals	1,500,000
Cost of Public Celebrations	500,000
Contingencies	1,000,000
Total	35,313,000

The returns are estimated in this sort: Entrance-fees — which in 1855 were 3,200,000 francs, and in 1867, 10,765,000 francs — are assumed at 14,000,000; the receipts for privileges of restaurants, and sale of catalogues, at 1,235,000 francs, the amount in 1867. It is hoped that four millions of francs will be got from the sale of the buildings. In 1867 it was 1,075,000 francs; but the greater size and special design of the projected buildings are expected to make up the difference. These estimates amount to 19,235,000 francs, and leaves 16,000,000 unprovided for, of which it is proposed that the city shall assume six millions and the state ten. In 1867 the deficit was twelve millions, and was divided equally between the two. But indirect returns to the government are estimated as follows: —

Increase in tax on freights by railroad, 13% as in 1867	9,500,000
Increase in tax on freight from transportation, 16% as in 1867	500,000
Increase in postage as in 1867	12,000,000
Decrease in interest guaranteed to railroads due to increased traffic	6,000,000
Receipts from telegrams, 11% as in 1868	2,000,000
Total	30,000,000

To these are to be added the increase in imports on articles offered.

THE ILLUSTRATIONS.

DEISGN FOR TRINITY CHURCH, SING-SING, N.Y. MR. H. M. CONGDON, ARCHITECT.

THIS design was prepared for a commanding situation on the hill above the town, and overlooking the Hudson. It furnishes accommodations for a rural congregation, and a Sunday school, which is to be added as a chapel in the future. Proving too expensive, the Committee ordered a second design, which was prepared, materially reducing the cost without lessening the accommodation; and it is expected that the work will be commenced in the spring. Native stone laid in rubble-masonry, with cut stone from the Dorchester quarries, will furnish the materials for the exterior.

DINING-ROOM AND CHAMBER FURNITURE. PROF. W. L. B. JENNEY, ARCHITECT.

This furniture was executed in Chicago on special order.

HOUSE OF H. WELLS, ESQ., NEWTON. MESSRS. LEWIS AND BRIGGS, ARCHITECTS.

THIS house, built of wood, was finished early in the present year. The most noticeable feature in the plan is a large hall on the first floor, which is intended for use as a sitting-room during the warmer months of the year.

EAST INDIAN SCULPTURES. — A selection from the Yusufzya sculptures, weighing twenty-two tons, has been sent to England by the Duke of Argyll. It comprises statues, pillars, and carvings of sacred subjects, etc., together with the whole of the carved facings of the steps discovered at Jawalgirl, representing various "Jatakas."

A WORD WITH CLIENTS. — III.

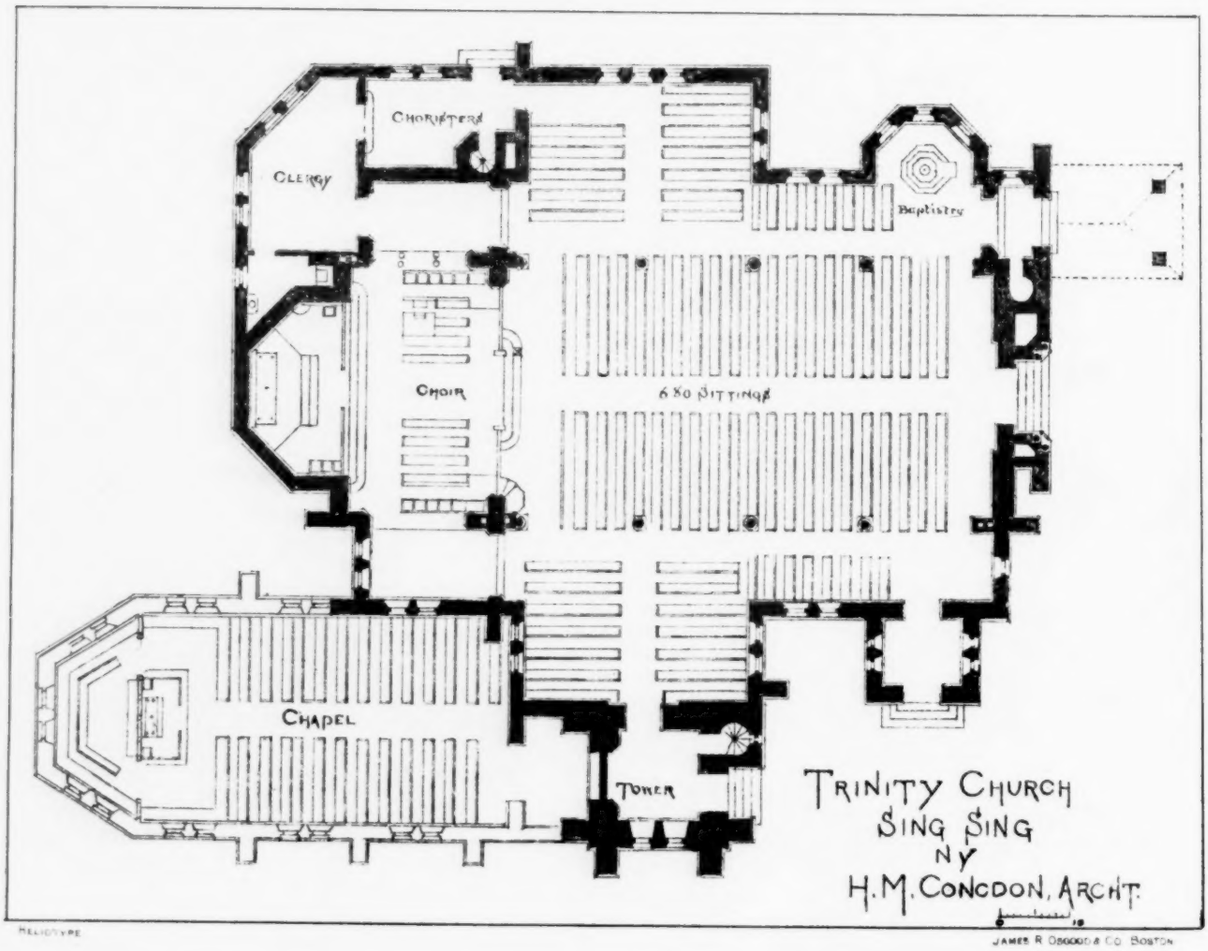
BY many, our forefathers are thought to have lived longer, and to have been a stronger and healthier race, than their descendants. The statistics of longevity show that this is not correct, that the average duration of life is higher at the present time than at an earlier period in our history; but the statement that we are exposed to many diseases unknown to our ancestors is borne out by facts which should lead to a more thoughtful consideration of the problem of life. We are a progressive people, alive to every thing calculated to promote our welfare, and add to our comfort; and our dwellings are in many respects vastly superior to what were considered first-class houses in the days of our grandparents. But the gain is too often attended by evils that have brought sickness and distress, nay, even death, into homes where, apparently, there was nothing to invite its approach. Let us see wherein this lies, and if there be not a remedy.

The old colonial houses — numbers of which, in a fair state of preservation, are still to be seen scattered over New England — are all very similar in design; and, with hardly an exception, they are marked by low ceilings, badly-arranged rooms, cramped halls, and an entire absence of any means of ventilation. They had (I say they had; for the openings are now usually built up, and supplied with grates) one saving grace, — an open fireplace, which, whilst it robbed the inmates of a great deal of heat from the glowing logs, carried off much of the vitiated air that had no other means of escape. The great throat of the chimney was exhaustive in its demands; but the supply was equal to the call. Currents of air found their way in through the imperfectly-fitting sashes, the cracks of the single floors, and the wide crevices (that not even strips of list could wholly fill) beneath and above the doors. No man could be perfectly comfortable, in the full enjoyment of the fireside, in a room of this kind, save in moderate weather. It mattered not how well the andirons were piled with logs, it was impossible to heat all parts of the room alike; and he who sat before the crackling fire was conscious of roasting on one side, and freezing on the other. The milk in the pantry was "condensed" without the aid of man; the water on the sideboard was crusted with ice; and it required no small degree of care to keep the frost from the apples and potatoes in the cellar. To bear with this, our grandparents were thickly and warmly clothed. Their stockings were of homespun yarn, and their backs were covered with garments of some woollen fabric designed for service and warmth, rather than for looks. During the day, their busy occupation kept up a cheerful glow in their veins; and at night they retired early, and buried themselves under thick patchwork comfortables, in feather-beds, sleeping in rooms no better ventilated than those below, and in which they would have died of suffocation, but for the chinks and crevices that served as inlets, and the big-throated chimneys that were equally serviceable as outlets. The strain told upon them, and doubtless tended to shorten the average duration of life.

But all this is changed in our modern houses. With our nicely-adjusted machinery, we make snug-fitting doors and sashes: our floors are all double, and many of them are deafened; and the chimneys are built with small flues, with no openings save for a small grate in the principal rooms, and the inevitable hot-air pipe in every apartment. All that man can do to make our houses warm and air-tight, is done, even to putting on storm-sashes; and then we kindle a monstrous fire in the cellar, so arranged that all the air we breathe must pass over plates of iron heated to a cherry red before it reaches us. Day and night it is the same. There is no complaining of a chilly feeling. Nothing freezes in the pantry; and the water is never turned off in the coldest weather. We are comfortable, and are therefore contented. Our backs no longer smart when we go from room to room; and an excessive amount of clothing is not needed. We have, nevertheless, taken a viper to our bosom that will certainly sting us. No man can rob his lungs of pure, fresh air, and not pay for it in bodily health. No man can habitually live and sleep in rooms warmed and ventilated as we warm and ventilate, without suffering in the end. Fresh air, and in large quantities, is as essential to our health and comfort as animal food and nourishing drinks. The supply must be regular and abundant; and, if the room is so contrived as to frustrate our wish in this respect, we should resort to an open window, so adjusted as not to throw a draught on the inmates, or on a bed, and yet open wide enough, particularly at night, to permit the air to find its way into every corner. There is a great prejudice against night-air; but the external air is purer than that which, from being re-breathed, is surcharged with deadly gases; and what air, after all, are we to breathe at night, save night-air?

RESIDENCE—OF—H·WELLS·ESQ.—NEWTON

W. WHITNEY LEWIS. Architects
W. RICHARD BRIGGS of Boston Jr.

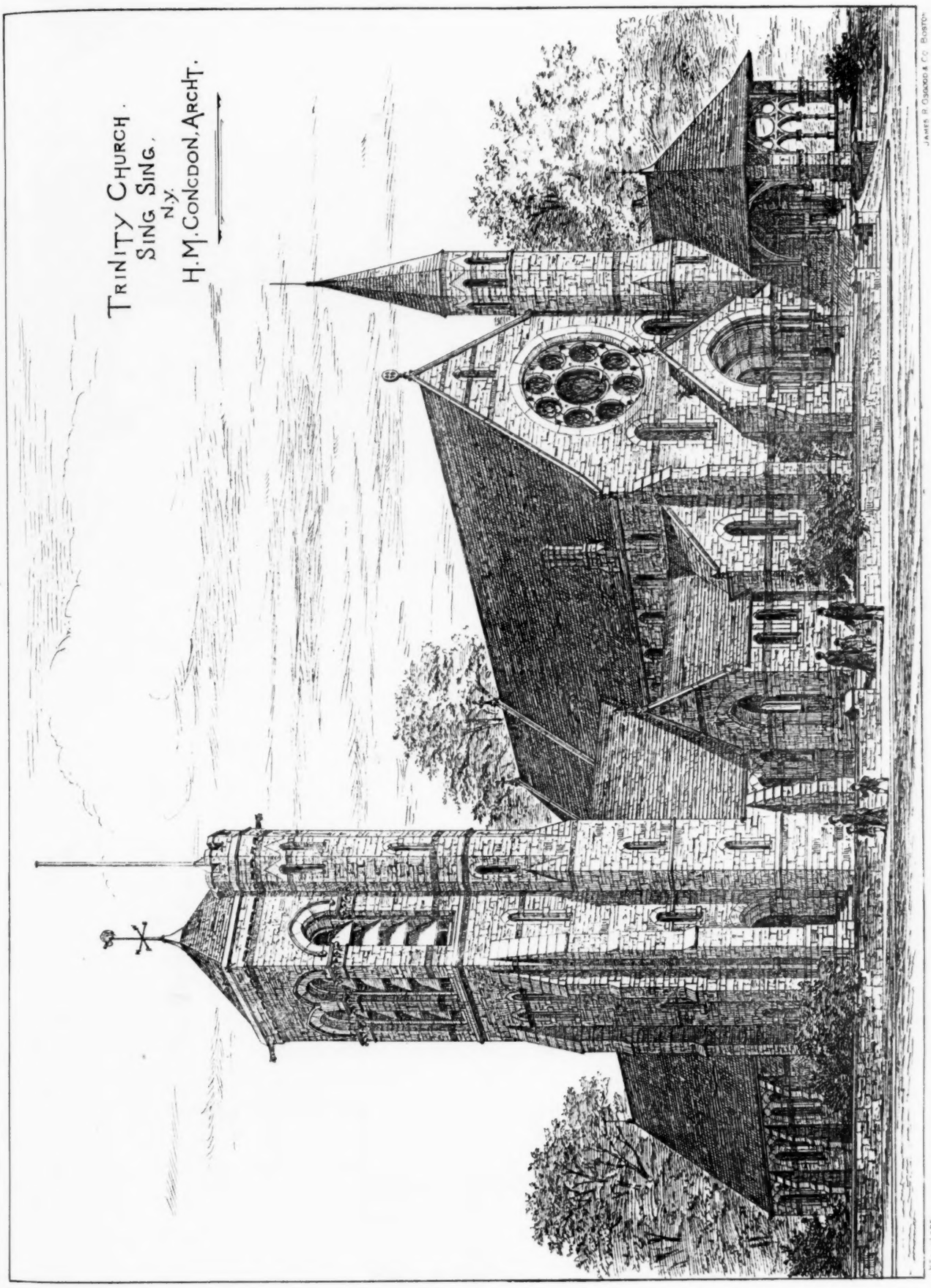


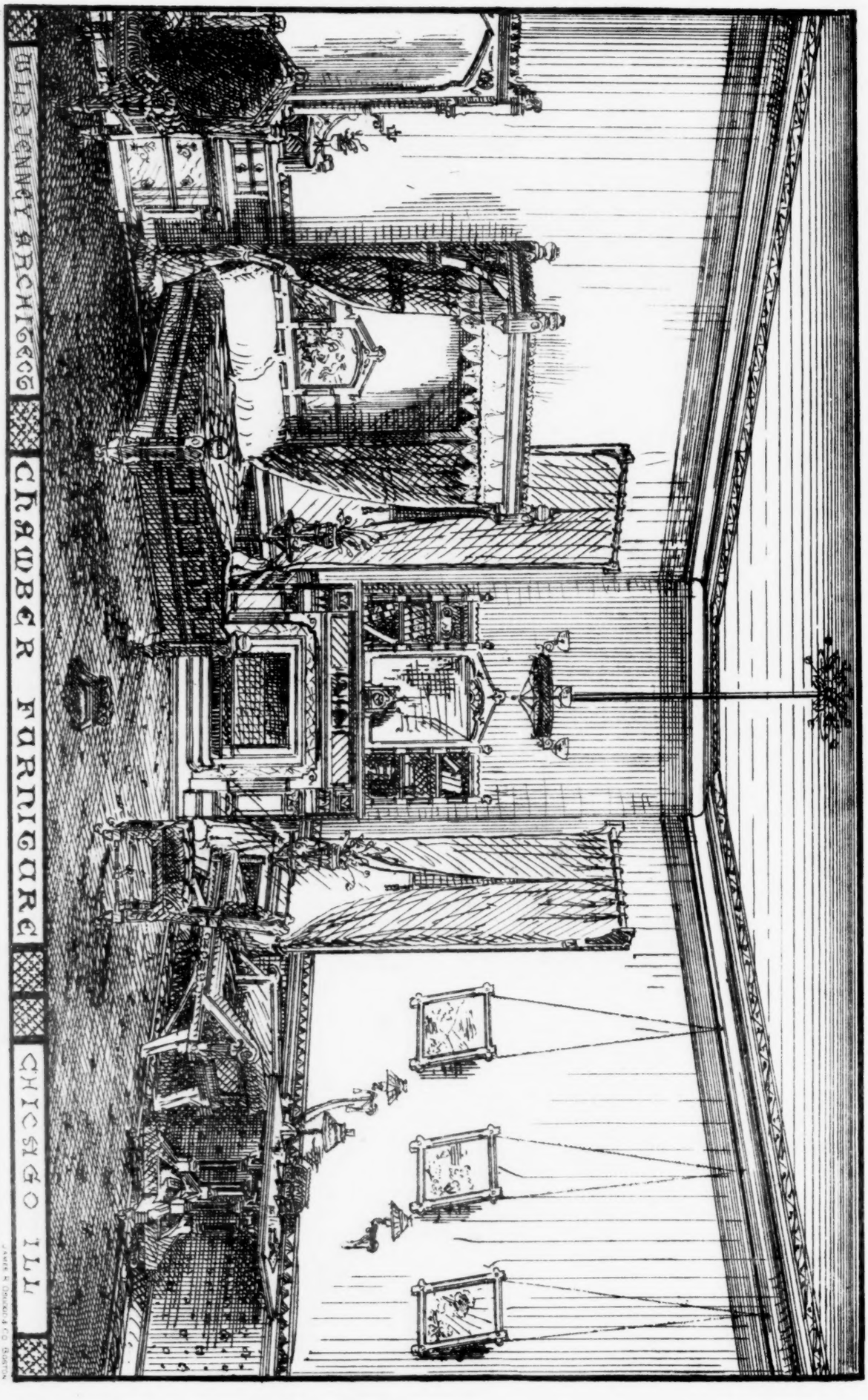
TRINITY CHURCH
SING SING
NY
H.M. CONCDON, ARCHT.

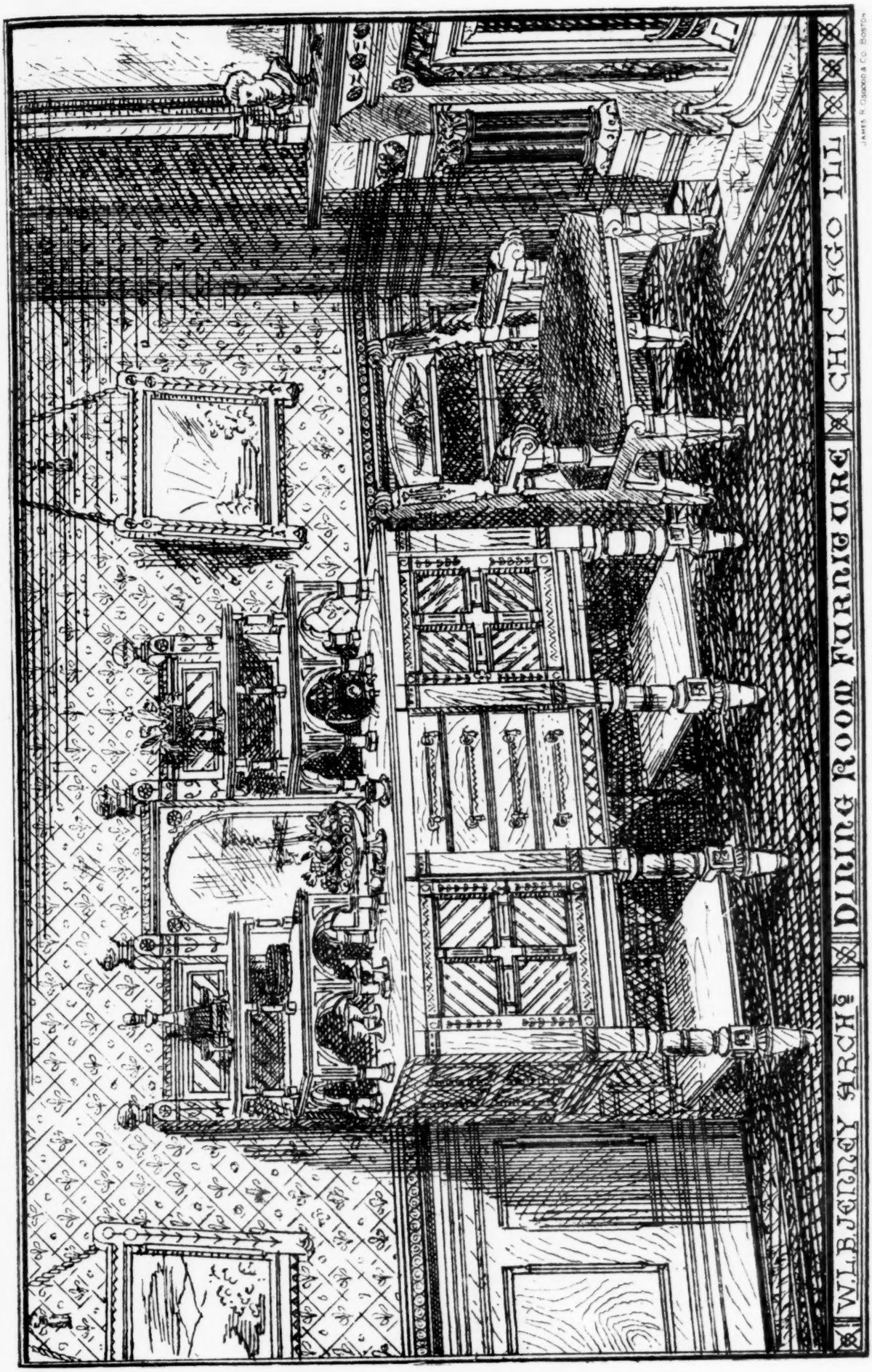
HELIOTYPE

JAMES R OSGOOD & CO. BOSTON

TRINITY CHURCH.
SING SING,
N.Y.
H.M. CONGDON, ARCHT.




W. B. JENNEY ARCHITECT
CHAMBER FURNITURE
CHICAGO ILL.


W.L.B. JENNEY ARCHT
DINING ROOM FURNITURE
CHICAGO ILL
JAMES R. OSGOOD & CO. BOSTON

It is not the night-air that does us harm: it is the want of it that develops diseases that were unknown to our forefathers. They suffered from hardships and exposure: we have overcome the trials they had to encounter, and, in our efforts to perfect our creature comforts, have not only shut out the cold from our dwellings, but, with it, the vitalizing air.

Another source of diseases from which our ancestors were exempt may be traced to what we term "modern improvements." In the old colonial houses, there were no ramifications of water-pipes, no water-closets, and no wide-mouthed hoppers on the chamber-floors for getting rid of the waste, that found its way at once to a place provided for it beyond the confines of the house. In this they had to submit to what we would call a great deprivation; but, on the other hand, they knew nothing of diphtheria, and kindred diseases. Stiggins said, when interviewed on the liquor question, "If there is any one of them less odious than another, it is the liquor called rum." And we may say, that, if there is a difference in the ways of getting rid of house-waste, the sewer is better than the open vault. But, whilst the sewer may be more effectual in removing that which emits gases deadly to man, it is equally true, that it may prove to be the more dangerous of the two, in that, if not properly trapped and perfectly ventilated, it will lead the poison into our dwellings, instead of removing it to a distance, where it can do no harm. The contents of the vault saturates the whole of the surrounding earth, poisons the springs and the wells, and finds its way in little currents through the interstices of the foundation-walls of our houses: there it throws off gases too slight to attract attention, but too deadly to be inhaled by the inmates with impunity. The soil-pipe is an improvement on this; but if it be not tight in all its parts, if there be any imperfectly soldered or calked joints, woe betide the man who sleeps near it; for the destroying angel is abroad, and will find him as surely as he lies down and rises up in an atmosphere so charged with the germs of disease. He may not be conscious that the foe is so near at hand; for the leak may be slight, and during the day its effect will be neutralized, in part, by open windows and doors; and, moreover, as "evil communications corrupt good manners," so the habitual inhaling of a noxious atmosphere dulls the senses; and we soon cease to detect the odor that would have startled us, had we not gradually become habituated to it. Any one may test this. Let him enter a crowded and badly-ventilated theatre, or other large building, and he will be met by a nauseating air that will almost repel him: but in a few moments he will find it less oppressive, and soon he will take no more notice of it than the crowds who have inhaled carbonic acid gas enough to insure to each a raging headache for the following day.

"Died of a bad air." How often these few words might, with truth, be inscribed on the headstones of both old and young! Our forefathers (and the custom is still prevalent in country towns) too often so placed the open vault on their premises as to make it almost certain that the well could not escape contamination, either from that source, or from the drain from the kitchen-sink; but, happily, if these adjuncts were placed widely apart, the family were exempt from diseases now so prevalent. The use of the vault was attended with inconvenience, particularly in cold and stormy weather; and on the delicate and sickly it must have told severely: but we have not thoroughly removed the evil by our present arrangement, which, though it is an improvement, is still very defective.

NOTES ON THE CONSTRUCTION OF AQUARIA.

THE following extract is taken from a paper read before the London Architectural Association, by Mr. J. Norton:—

"I cannot resist showing you what Mr. Lloyd considers the earliest English view of an aquarium, dated as far back as 1743. It is a glass cylinder about 5 by 3 inches, containing zoöphytes. The next illustration is that in the garden of the Zoölogical Society, Regent's Park, erected in 1852, and, although only a shed with a light iron roof, has the honor of being the first actual building erected for the special purpose, and the precursor of the palatial buildings since erected. Other illustrations show the aquaria at Brighton, Paris, Berlin, and Boulogne, Naples, and Hamburg. The plan of the latter shows a vaulted central hall with the show-tanks on each side, lighted by a continuous skylight, with rooms at the end for table-tanks. The building is sunk to more than half its height underground, and appears to be admirably arranged, although on a small scale.

"The next is the well-known building at the Crystal Palace, erected in 1871, with a corridor 250 feet long by 20 feet wide, having the show-tanks only on one side, 19 in number, varying from 25 feet to 10 feet frontage, and about 10 feet in depth. On the garden side are two well-lighted rooms containing the table-tanks. All are for sea water, but a large fresh-water tank is in course of construction at the north end; and beyond are the rooms for engines, boilers, and steam pumps. A notable peculiarity here is the ambulatory running parallel with and at the rear of the show-tanks, in which are placed an equivalent number of tanks in reserve, containing also shrimps, etc., as food for the fish. Light is admitted by a skylight running continuously the entire length over these tanks and passage, illuminating the show-tanks at an angle of about 30 degrees. Underneath the public saloon is the reserve cistern, containing 100,000 gallons of sea water, to supply the show-tanks which contain only 20,000 gallons. The sea water introduced in 1870 has never been renewed, except to make good evaporation, and is as clear as crystal. The engines are constantly at work, night and day, discharging the water from the cold underground cistern into the show-tanks, where it is continually overflowing back into the cistern. This system of a never-ceasing current has resulted in securing brilliancy of water and great healthiness of the fish, and attests the accuracy of Mr. Lloyd's views. The opposite or aërating system at Brighton and elsewhere certainly does not produce the same satisfactory results.

"At Weymouth the site is very circumscribed; and, whilst the aquarium was of necessity to be the main feature, it was at the same time desired to combine the attractions of a music hall and winter garden. The enclosing walls are recessed to hold shallow table-tanks, etc., and support galleries for the orchestra and spectators; the whole is roofed with glass. External to this saloon are parallel corridors 200 feet long and 9 feet wide, forming ambulatories to view the eighteen show-tanks, which are respectively 39 feet frontage and 13 feet depth, 19 feet by 13 feet, and 20 feet by 3 feet 6 inches. Reference to the Manchester plan shows the origin of this special arrangement, but with the notable variation that, whereas there the walls which separate the corridors from the main hall are pierced with arches, throwing a confused light upon the fronts of the show-tanks, we have adopted solid partition walls; and, as the skylights extend only over the tanks, the corridors are in comparative darkness, and receive light only through the luminous water. The failure of this precaution at Westminster has produced sad results; for instead of seeing the fish I have found I could only see the reflection of myself, tables and chairs, etc., the evil being further increased by the extreme smallness of the lunette windows intended to illuminate the water, — an evil now in course of remedy by the substitution of larger lunettes. The estimated cost of the Weymouth building is 30,000 pounds.

"The site of the Great Yarmouth Aquarium is the north end of the Marine Parade, close to the Britannia Pier, one acre in extent. The great hall is 194 by 60 feet, the nineteen show-tanks ranging the entire length of both sides; fifteen of these are for sea water, and four for fresh water. They have frontage of 50 feet, 33 feet, and 16 feet, and are mostly 15 feet from front to back, though some are as shallow as 7 feet by 5 feet for special purposes. The water occupies a depth of 5 feet, and the bottom of tanks is 3 feet 6 inches above floor level. The reservoirs range underneath the tanks, from which they are separated by arches resting on iron girders; and both bottoms and sides of reservoirs and tanks are lined with Val de Travers asphalte three-quarters of an inch thick, well tucked into the joints of the brickwork, specially raked out to receive a key. The depth of water is the same as above, viz., 5 feet, the proportion therefore being 1 to 1. They are purposely kept dark. The show-tanks receive light on the west side by a continuous skylight 6 feet wide; those on east side by large windows, the cells of which are 6 inches above the water line. In the centre of the hall will be the orchestra, and ranged between the iron columns will be placed table-tanks. These are made of thick plate glass with enamelled slate tops, angles, and bottoms. They are 3 feet 6 inches diameter, 3 feet 1 inch from floor, and a depth of 1 foot 7 inches of water, giving a total height of 4 feet 8 inches. A seal-pond is sunk out of the floor at south end, and an alligator-pond at north end, — the latter heated artificially, and both measuring 17 feet by 13 feet, with a depth of about 5 feet of water. The width of site (not allowing for passage and reserve tanks, as at the Crystal Palace, a gallery running the entire length above the glass fronts of tanks) allows the attendant access to feed the fish. Space is gained at the ends for reserve tank and rooms for the naturalist and his assistants. The entrance to the aquarium and future skating rink is by two vesti-

bules, 18 feet wide and 100 feet in length. The rink will occupy the remainder of the ground to the south, and the restaurant that to the north. Underneath the north vestibule are placed two vertical boilers, two horizontal steam engines, three four-inch rotary pumps, each capable of raising 8,000 gallons per hour; and two other three-inch rotary pumps, each capable of raising 5,000 gallons per hour; and two other pumps, capable of raising 7,500 gallons per hour. These will secure a constant circulation all the year round between the store reservoirs and the show-tanks, both sea and fresh water. The water to the table-tanks and seal-pond is laid on by pipes running in trenches under the asphalte and cement floor, which contain also the heating-pipes. It is intended to build a great music hall over the aquarium, club and billiard rooms over the restaurant, and a glass winter garden over the skating-rink.

"A few words by way of recapitulation: The noticeable distinction between the various plans I have submitted to you is the relative position of the show-tanks with respect to the ambulatory or spectator. At Westminster we see the evil effect of the tanks forming the sides of an overlighted hall; at the Crystal Palace and Brighton, the benefit of keeping this hall in comparative darkness; at Manchester, the first suggestion of an aisle, since actually developed in the designs for Weymouth and Clifton, where the nave is entirely cut off, and serves as a winter garden; the aisles forming the walk for spectators only, deriving light through the plate-glass fronts, the water in the tanks being brilliantly illuminated.

"The question as to the necessary proportion of water kept in the dark reservoirs, as compared with that in the show-tanks, is now being debated by those two eminent authorities, Mr. Lloyd and Mr. Saville Kent; the former insisting that it should never be less than 3 to 1, the latter affirming that a proportion of 1 to 1 is all that is essential for success. Where such philosophers disagree, it is difficult for us to decide; but in practice motives of economy, as a rule, determine the question, clients being unwilling to expend thousands of pounds in constructing underground cisterns where such an authority as Mr. Kent assures them that the reserve need not exceed the contents of the tanks themselves, which can thus economically be built, as at Yarmouth, in the space between the ground and the floor of the show-tanks.

"There is no necessity for sinking an aquarium underground, as at Boulogne and Hamburg. There is no need to change the sea water: in fact, it is proved to be better suited to maintain healthy animal life now than when first imported six years ago.

"The method of oxygenating the water by means of a constant flow and change has so completely taken the place of the old system of aërating, in forcing air either from below or above, that, in any buildings we are called upon to design, it must be accepted as a *sine quâ non*, and arrangements made for steam engines, boilers, and steam pumps.

"A continual source of annoyance at the Crystal Palace, Westminster, and other aquaria, has been the frequent bursting or blowing-out of the glass fronts of the tanks, which, though of the thickest plate, have been found unable to bear the great pressure of the water. It is to be hoped that experiments will now be made with the new toughened glass, which is said to resist five times the ordinary breaking strain, and by which the depth of water may be indefinitely increased without danger. The greatest care must be taken in fixing the glass to the iron frames or mullions, and the stone heads and sills, so as to secure a perfectly even bed or surface, and minor precautions taken which time does not allow me to enter upon.

"It is better to adopt asphalte than cement for the inside coating of the tanks and reservoirs, and no expense should be saved in getting the work done in the best possible manner. The tanks are furnished with rock-work composed of granite, Derby spar, or Portland spalls, varying in thickness from 10 inches to 3½ feet, put together with Portland cement. The back of the seal-ponds may be fitted with rustic rockeries, waterfall, ferns, palms, mosses, and creeping plants.

"As no aquarium in its present highly developed form is supposed to contain sufficient interest to secure permanent success, it is now considered necessary to supplement its attractions by subsidiary features; and hence the necessity to provide music and concert halls, winter gardens, skating-rink, club-rooms, restaurants, baths, and pleasure-grounds."

GLASGOW. — It is said that there are six thousand unoccupied houses in Glasgow, Scotland. The cause is speculative building.

VENTILATION OF REPRESENTATIVES HALL.

MR. ROBERT BRIGGS has sent us a letter apropos of our notice of his report on the ventilation of the Representatives' Hall at Washington. After some remarks which, for reasons given below, we omit, he says, —

"The third paragraph of your issue of July 29 is full of misleading expressions. 'The bad quality of the air *said* to be supplied.' I asserted that the air supplied *was* as good as could be had within the limits of the city of Washington, and that it has been so at all times since the construction of the apparatus. Examination will demonstrate this, if the examination be made by competent persons; and the Report, pages 3, 4, 5, 6, , sets forth the fact conclusively. The Report gives every facility to reason upon the derived vitiation of air in the hall. It sets out (page 21) that only 15,000 feet of air per minute could be supplied at the utmost since the changes in the building, which is but one-third to one-sixth the quantities imperatively demanded. And then it sets out that 10,000 feet were borrowed from the discharge ventilating-flues and chimneys of the system for heating and ventilating the rooms of the south wing, which surround the hall itself (page 25). The careful reader of the Report will deduce (from page 6) that the south wing is a building, whose outside dimensions are 230′ x 135′ x 60′ (high), within which there is a hall, whose inside dimensions are 139′ x 90′ x 36′ (high); so that, making allowance for walls, the clear space within the building may be taken as divided into about three parts, two of which are committee, officers', and other rooms, and one of which would be the hall. The cellar, also, is occupied by kitchens, some offices, and as storage rooms. The ventilation and heating of this *outer* space was originally effected by, and accompanied with, a supply of fresh air of 40,000 to 80,000 cubic feet per minute, which quantity can be compared by juxtaposition to the 50,000 to 100,000 supplied for the hall. Auxiliary fireplaces for radiant heat were placed in each separate room. Many of the rooms and passages were dark, or at best but inadequately supplied with natural light; so that gas-light has always been needful at all times in the day. A great restaurant occupies a large place in both the basement and cellar. Water-closets, used by thousands of persons daily (by actual count), have unclosed doors communicating with the passages. The whole system of ventilation for these outer rooms has been suspended at times, or, at the best, only used to one-eighth of its capacity. The means for controlling the heat were so deranged (page 26), that, on a mild day, one-eighth of the proper volume of air would impart so much heat to the rooms as to be unendurable. Under these conditions, in this well-enclosed building, from want of supply of air to these outer rooms, their escape ventilating-flues and the chimneys of their fireplaces became almost inoperative. And when the suction fan was applied to the hall, which has numerous fly-doors opening into it from the surrounding corridors, there was exhausted from these rooms, passages, offices, eating-rooms, and water-closets, the smoke from the fires, the gases of combustion from the lights, the vitiated air from more than a thousand persons, the odors from the kitchen, and the stenches from the water-closets; all of which were sucked through the hall itself (pages 42, 43). If this list of abominations, which were distinctly stated in my Report (although without the prominence of assertion here given, which I did not consider fitted for an official paper), 'does not seem sufficient to account for all the phenomena that are reported,' then I hold that the insufficiency is inherent in the English language, not in the facts.

"With regard to the conflict of authority as to the 'tainted' air supplied, which is stated in the editorial. It is impossible to argue against a statement. If a man says two and two are five, you can believe him or not, as you please; and when it is asserted that air becomes tainted in passing through two vaulted rooms in a cellar, or parts of three, bricked off by solid walls, and when these rooms have stone walls, five or six feet thick, laid in cement mortar on two sides, and other stone walls, three feet thick, on the other two sides, — rooms which have an impervious solid brick masonry floor, laid on earth, which earth is dry gravel-filling over thirty feet deep, and the rooms themselves are covered by eighteen inch groined vaults, — the rooms being perfectly dry, perfectly sweet, and perfectly clean, and that through these rooms (or parts of them) the air passes in the volume of fifty thousand to a hundred thousand feet per minute, and at the velocity of flow of about a thousand to two thousand feet per minute, — when it is asserted, I say, that this air is '*tainted*' in passing through a cellar, it is a matter to believe, not to reason upon. Similarly the Committee Rooms air-supply is through an arterial system of underground air-ducts, from four feet to two feet and a half in diameter. These

ducts are laid under floor, on the lines of some of the passage-ways in the cellar. They are of solid brick-work construction, of the usual barrel form for drains, nine inches (or a brick) in thickness, laid in cement mortar, and cement lined, and extend in two directions from the fan room (like a tree, of two stems near the root, upwards) to the heating-coil-chamber, under the several rooms, or places to be heated. The coil-chambers are built with equal solidity and care, and have iron doors which were ground to fit air-tight. The ducts are without break or opening; and as the sewer system of the building was a central line lengthwise, with branches at right angles, and the air-duct system was located in two lines lengthwise of the building, the two systems were generally over fifty feet distant from each other, in lines substantially parallel. Of course, one main branch of the air-duct crossed over the main sewer line at one point at right angles; but here the greatest care was taken to protect the air-duct from emanations.

"The air-ducts thus described were and are yet both water and air tight, although the former qualification is not necessary, as the ground under the cellar-floor is clean gravel, and perfectly dry; and through these air-ducts there should pass, for at least twelve hours out of each twenty-four (and sometimes at all hours of the day), the volume of from forty thousand to eighty thousand cubic feet of air each minute, at the velocity of a thousand to two thousand feet in the same interval of time: the entire air in the ducts and coil-chambers would be changed from twenty to forty times each minute. Now, if it is asserted that this air is '*tainted*' in passing through the ducts, the assertion is simply a matter for credence. Of course, if the ducts are disused, their walls will become cool from the ground, or, retaining the temperature of last usage in cool weather, they will be likely to condense moisture from the summer-air, and such condensation will generate mould, under very favorable conditions for mouldy growth. This actually occurred, as was testified to me by the present engineer, and I accepted the fact as evidence that the system of ventilation had been disused entirely, during the summer vacation of Congress. The inference, however, which is possible, and, I think, probable, from the words of the third paragraph of the editorial, that the ducts, as ducts if used and kept in order, would give 'tainted air,' is the one which I am trying to combat. I will not consent that this implication shall be permitted to remain unanswered.

"But the final averment of the paragraph involves the most essential error of statement in the whole notice. 'There is no doubt that either [an upward or downward ventilation] system can be made to work,' of course referring to the use of either system in the Hall of Representatives. I cannot think that on this point, where I have tried to be so clear and explicit, proper consideration has been given to the arguments in the Report, see pages 9 (commencing at 'The comfortable temperature') 10, 11. These pages give, as briefly as I could employ the language necessary, the governing reason in support of an upward system of ventilation for the hall; and they should be read carefully by those who have 'no doubts.' On pages 44 and 45, will be found an allusion to downward ventilation, and admission of its practicability in some cases; but as to the hall itself, the attempt at downward ventilation will result, if it is ever made, as disastrously as other attempts on other halls. There *must be*, in winter, thirty cubic feet of air per minute per individual, whenever the session is protracted beyond the time that the fresh air in the hall, at its opening, will reach some admissible vitiation. Upon *each* four or five square feet of floor-space, one person of the audience will have been placed: whence it follows, that the thirty cubic feet of air must pass his head and shoulders at the rate of seven to eight feet per minute. At the temperature requisite to preserve comfort in such a crowded room, this current of descending air will not be tolerated. Wigs are not in fashion in America. It is also to be noticed, that, in the Hall of Representatives, the form of the room would necessitate the passage of a large part of the air for ventilation of the galleries to descend to the floor of the hall, as stated (page 11) in the Report. Whenever the quantity of air is accepted, the conclusion will inevitably follow that it can only be introduced in vertical currents, from below upwards, by impulse, and not by suction.

"This question of ventilation of the Capitol has been the subject of much inquiry and many reports; but it has always seemed to me that real information was not sought for or wanted. I have in my possession now some three thousand pages of reported matter. Perhaps one hundred pages of these refer to examinations into the nature of air in the halls, inquiries made without, or with little, regard to the working of the ventilating system, — certainly without statement of concurrent operation. There are two hundred pages more of scientific investigation in hydration, — cooling, — and the chemical constituents of atmospheric air, with collated information from all languages on these subjects. There are twenty or thirty pages of testimony in the shape of answers to questions; such as 'What do you use in the warming pipes, — hot water, or steam? Answer, Steam.' While the remaining about twenty-five hundred pages are opinions, views, proposals to provide entire apparatus which will be guaranteed to work (which apparatus, so far as it should be suitable, would be found to be what is now in the building), and proposals to add some new or old contrivance to the present system, whereby all its (assumed) defects shall be overcome [and I suppose congressmen will live forever]. With all this information, nothing yet has been published describing what it was essayed to do, or showing how the essay was to have been accomplished. Gen. Meigs, under whose charge and responsibility the work was constructed, has been in Washington the past twenty years (excepting only two years, 1859–60–61); and, except one questioning before a committee, he has never been called upon to advise with any one possessing control of the apparatus; and his or any other volunteer opinion would have been (perhaps properly) resented. The writer was well known to all those connected with the erection of the Capitol extension, and to many others in Washington and elsewhere, as possessing the fullest knowledge of the building and the apparatus, of what was necessary for the preservation and operation of the latter; but it was nobody's interest that it should be either operated or preserved, and it was the interest of many constituents of many members that neither should it be. The Report which forms the subject of the editorial was hurriedly prepared, for the instruction of the Commission to which it was made, to give them an understanding of the system as originally proposed, restricting its explanation to the hall above, and omitting any description of apparatus. For public use, the description of apparatus and of details of construction would be more valuable. Such a description should accompany the first report to Congress."

[Some remarks on the first paragraph of our notice were based on misunderstandings of what we said, which we think our other readers are not likely to have shared, and, for the sake of brevity, we omit them. The further account which Mr. Briggs gives of the ventilating appliances will be of interest to our readers; but we must notice one or two misapprehensions of our meaning. The paragraphs to which he refers were not intended as a review of his Report, but merely called attention to one or two salient points in it, as we are in the habit of doing to the various matters we touch on in our summary; nor did we devote our attention exclusively to Mr. Briggs. The first two paragraphs concerned his Report: the third reverted to the general discussion upon which we had touched before. Thus when we wrote, "the bad quality of the air that is said to be supplied," we did not mean said by Mr. Briggs; for he intimates pretty distinctly (and this is what surprised us) that no bad air came through the air-ducts, although there was, we thought, abundance of other testimony that bad air did so come. Mr. Briggs's account shows pretty clearly that bad air came also from the surrounding rooms and corridors; but that does not prove that all the other air is fresh, and the indications were that the air was at least tainted before it got into the ducts. We do not see that any thing which we wrote justifies Mr. Briggs's inference, that we believed that the ventilating system, "if used and kept in order," would give bad air: on the contrary, we said explicitly that there seemed no doubt that it would have worked well, if it had been properly administered. The great number of published complaints seemed to us to support Mr. Severson's distinct statement, that the air was bad when it was introduced. Mr. Briggs thinks not, and we respect his opinion, without being yet convinced by it. With regard to the question of upward and downward ventilation, again our remark was a general one. Both systems have been made to work in various places. Mr. Briggs has no doubt considered the applicability of a downward ventilation in the hall in question carefully enough to speak with confidence against it; but his remarks seemed to us

directed against downward ventilation in general; and in this view his argument is certainly incomplete. Perhaps we misunderstood him; we are glad if we did; we should have done well ourselves to have made sure on first writing that the two passages we have explained should be understood to be general, and not personal to Mr. Briggs. — EDS. AM. ARCH.]

BLOWERS *vs.* TABLIERS.

TO THE EDITOR OF THE AMERICAN ARCHITECT.

Dear Sir, — The attention of grate-manufacturers should be called to a simple and very convenient arrangement, invariably used on the Continent, but rarely seen here. There the blower forms part of the construction of the fireplace, and, when its services are to be dispensed with, is made to slide up out of sight, or, by turning a knob, to disappear at the sides. Nothing can be more inconvenient or ugly than the blower as we construct it: soon getting out of shape it is difficult to fit on, and when well heated is unpleasant to take off; and when off there is never a convenient place to keep it.

The front of the foreign grate is usually flush with the facing of the fireplace, which simplifies any such mechanism; but it would seem that ingenuity might be directed to accommodate this arrangement to almost any design. C.

NOTES AND CLIPPINGS.

FANEUIL HALL. — In 1742 the town of Boston received the gift of Faneuil Hall, intended for a market and a town hall; and the separation of the town and province buildings must have been effected at that time. Here the first city government was organized. In 1830 the building was converted into a city hall, and so remained until 1840, when the present locality was taken. Faneuil Hall has been so transmogrified since the Revolution as to have but little more than a name remaining. It was built forty by one hundred feet, with two stories. In 1806 the width was doubled, and a third story added. Such changes have left but little of the original building. All the surroundings of Faneuil Hall are also changed.

A CHALK HOUSE. — An exchange says that almost pure chalk exists in vast beds in Trego, Kansas, and a house has been built of sawed blocks of it.

SECULARIZING CHURCHES. — The New York *Express* says, "The number of old churches which have been turned into business houses in this city is quite large. The Post-Office occupied the Middle Dutch Church on Nassau Street for thirty years. The Quaker meeting-house at Hester and Elizabeth Streets, erected in 1818, has for a long time been the office of the New York Gas Light Company. The Amity-street Presbyterian Church is used as a stable by A. T. Stewart and Co. A livery-stable occupies the Sixth-street Presbyterian Church near Second Avenue; and there is another stable in a church in Twenty-third Street near Sixth Avenue. The Church of the Messiah, in Broadway, opposite the New York Hotel, is a theatre. The Presbyterian Church in Fifteenth Street, near Third Avenue, is known as Nilsson Hall. A Universalist church in Twentieth Street, near Seventh Avenue, is used as a bakery. A mineral-water manufactory occupies a church on Franklin Street, near West Broadway. Old St. Ann's Church, in Eighth Street, near Fourth Avenue, is being turned into a factory for A. T. Stewart and Co."

INDIAN MOUNDS. — On a high bluff near the mouth of the Iowa River are some wonderful Indian mounds. On a level with the surface of the ground are the remains of circular floors made of baked clay and the trunks of trees laid close together. These floors are covered with earth from two to six feet in depth; and at the bottom are human bones of extraordinary size, copper axes and spikes with handles of polished horn and petrified wood, heavy stone hammers, and sharp flint knives; and images of animals and birds accurately carved and well polished, and made of a hard reddish stone.

A SPUR FOR INVENTORS. — A medal of the value of £20 has been founded by Mr. Benjamin Shaw, of which the Society of Arts has accepted the trusteeship. It is to be awarded every fifth year, in accordance with the following terms: "For any discovery, invention, or newly devised method for obviating or materially diminishing any risk to life, limb, or health, incidental to any industrial occupation, and not previously capable of being so obviated or diminished by any known and practically available means."

The first medal is to be awarded in May, 1877.

ACCIDENT TO A CLAY MODEL. — Mr. Hutchison, R.S.A., having, after eight months' continuous work, completed the clay model for a colossal statue of the late Mr. Adam Black, left it on Friday night (14th ult.) finished, and in good order. On Sunday it was in good order when moistened by an assistant. At seven o'clock the next morning, it was a mere wreck. The left arm, the left side, and the upper half of the left leg, together with a large portion of the front of the body, had fallen away, while the parts that were left were scarred by numerous cracks and fissures; the framework of wood and iron which replaces the skeleton of the human figure being uninjured. The only explanation that is offered is, that, owing to the excessive heat of the studio, air confined in the cavities of the model had expanded, and destroyed the model. The clay, of a reddish tint, brought from the neighborhood of Tinto has been frequently used by Mr. Hutchison in making clay models for bronze castings.

THE GREAT DOLWILYM CROMLECH. — This cromlech is said to be one of the most perfect and interesting of the Druidical remains in Wales. Originally it consisted of five, or rather six stones. The tallest upright stone is four feet four inches high, and the gigantic cap-stone measures eleven feet six inches by eight feet ten inches.

When the chambers formed by the upright stones of cromlechs are examined for the first time, unquestionable evidence of burial is invariably found. It may, therefore, reasonably be inferred, that, as all cromlechs are so much alike in general design, they have all been constructed over places of burial. It is also generally supposed that the interstices of the stones were originally filled up with rubble-work, and the whole structure covered with a mound of earth. The labor of erecting some of the dolmens found in England must have been immense; and the honors of cromlech burial must have been extended to a very limited class, — a class belonging to a past time so remote, that as far as present knowledge goes, no date can be assigned to it.

A GERMAN MILITARY KITCHEN. — The German Government has recently built a kitchen a thousand feet long, and all of stone and iron, to supply food for the army in time of war. Its machinery is driven by two eighteen hundred horse-power engines, and is capable of boiling down and condensing within portable limits a hundred and seventy oxen, grinding three hundred and fifty tons of flour, and making three hundred thousand loaves of bread daily. It is also able to supply enough preserved oats for one day's feeding of the horses belonging to an army of two hundred and eighty thousand men.

TOPOGRAPHY OF ROME. — The German explorers in Rome have always been unanimous in the opinion that the Capitol, together with the Temple of Jupiter, and the Tarpeian Rock, was situated on the south-west point of the Capitoline Hill, near the site of the Caffarelli Palace, which is now owned by the German embassy, and near which the new German Archæological Institute has recently been built. The Italian archæologists have hitherto held, that the temple should be sought for on another part of the hill; and the director of the Roman explorations, Senator Rosa, has by word and deed, at all times, enforced this opinion. The foundation of a large building which was a short time ago brought to light on the Caffarelli Hill, and some pieces of colossal statuary found near it, have, however, given such evidence in favor of the German theory, that, among others, Secretary Lauriani of the Municipal Archæological Commission has become convinced of its correctness.

IRON-RUST. — The rather old notion that fires may be caused by iron-rust is thus defended by a recent English writer: "When oxide of iron is placed in contact with timber excluded from the atmosphere, and aided by a slightly increased temperature, the oxide parts with its oxygen, and is converted into very finely divided particles of metallic iron having such an affinity for oxygen that, when afterwards exposed to the action of the atmosphere from any cause, oxygen is absorbed so rapidly that these particles become suddenly red-hot, and, if in sufficient quantity, will produce a temperature far beyond the ignitible point of dry timber. Wherever iron pipes are employed for the circulation of any heated medium (whether hot water, hot air, or steam), and wherever these pipes are allowed to become rusty, and are also in close contact with timber, it is only necessary to suppose that under these circumstances the finely divided particles of metallic iron become exposed to the action of the atmosphere (and this may occur from the mere expansion or contraction of the pipes) in order to account for many of the fires which periodically take place at the commencement of the winter season."

FIR. — The Olympia (Wash. Terr.) *Transcript* calls attention to the excellence of the fir growing on Puget Sound for ship-building: ships built of this wood nearly twenty years ago are now nearly as good as new.

BELLS. — The following list of the reputed weights of some of the most noted bells in the world is taken from the *Manufacturer and Builder*: —

	Tons.	Cwts.	Qrs.	Lbs.
The Great Bell at Moscow	198	2	1	0
St. Juan's (also Russian)	80	0	0	0
" " "	57	1	1	16
The Great Bell at Pekin	53	11	1	20
Bell at Nankin	22	6	1	20
" Olmutz	17	18	0	0
" Vienna, dated 1711	17	14	0	0
" Notre Dame, Paris, 1680	17	0	0	0
" Erfurt (the finest bell-metal extant)	13	15	0	0
" Montreal	13	10	0	0
Great Peter, York Minster, 1845	10	15	0	0
Great Tom, Oxford	7	11	3	4
Great Tom, Lincoln	5	8	0	0
Dunstan, Canterbury	3	10	0	0

The Montreal bell was cast by the founders of the Great Peter of York, the Great Tom of Lincoln, and the Dunstan of Canterbury.

CHURCH BUILDING. — Since 1840, 1,727 churches have been built in England and Wales, and 7,144 churches have been restored. These building-operations have caused an outlay of £25,548,703.

PAINT. — For rough woodwork a cheap paint can be made by melting together six pounds of pitch, one pint of linseed oil, and one pound of brickdust.